Hanford Chronic Beryllium Disease Prevention Program Plan

Prepared for:

U.S. Department of Energy
Richland Operations Office
Richland, Washington

Prepared by:

Bechtel Hanford, Inc.
Hanford Environmental Health Foundation
Fluor Daniel Hanford, Inc.
Pacific Northwest National Laboratory

Mr. S.D. Liedle, President
Bechtel Hanford, Inc.

Mr. H.J. Hatch, President
Fluor Daniel Hanford, Inc.

Ms. S.J. Matheson, President
Hanford Environmental Health Foundation

Dr. W.J. Madia, Director
Pacific Northwest National Laboratory

Hanford Chronic Beryllium Disease Prevention Program Plan

1.0 PURPOSE

Exposure to beryllium above the Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) of 2 ug/m^3 can produce chronic beryllium diseases such as berylliosis and cancer. Recent epidemiologic studies have also revealed that workers exposed to levels below the current OSHA beryllium PEL can develop a sensitivity to beryllium, which places them at an elevated risk of subsequently developing chronic beryllium disease.

The purpose of the Hanford Chronic Beryllium Disease Prevention Program (CBDPP) is to establish a coordinated system among the Hanford Site Contractors to identify employees who have potentially been exposed to beryllium from past operations and to prevent exposures to workers during decommissioning and demolition of buildings that are potentially contaminated with beryllium. This CBDPP plan establishes an action level and surface contamination limits that address the occurrence of sensitivity to beryllium at exposure levels below the current OSHA beryllium PEL.

2.0 SCOPE

The CBDPP applies to all Hanford Site Contractors who are responsible for facilities where beryllium operations have previously been conducted and to any current contractor or subcontractor operation, including decommissioning and demolition, that has the potential for airborne beryllium exposure above the action level stated in this plan. The CBDPP also applies to the release of equipment, salvage, and other material from these facilities, and to the release of facilities for use by others. This CBDPP does not apply to current or future laboratory or laboratory-scale operations (as defined by OSHA) involving beryllium that are subject to the requirements of 29 CFR 1910.1450, “Occupational Exposure to Hazardous Chemicals in Laboratories.” However, in estimating past beryllium exposure, all beryllium exposures (including those in laboratories) will be considered, and present laboratory use of beryllium will be documented on the baseline inventory.

The CBDPP covers all current Hanford employees who have previously been or currently are exposed to beryllium while working at Hanford. It does not address former Hanford employees; former employees are being addressed by the former worker program at the University of Washington (University of Washington 1997).

3.0 RESPONSIBILITIES

Hanford Site Contractor management must implement the CBDPP at all levels throughout the Hanford Site, including

- integrating elements of the CBDPP into existing programs for safety, health, training, and work activity planning

- assessing beryllium exposure hazards before work activities are conducted and ensuring that control measures, monitoring equipment, and personal protective equipment are adequate to protect human health and the environment

- identifying facilities where beryllium has previously been used and assessing the potential for exposure

- providing current employees who have previously been or are currently exposed to beryllium with the opportunity for appropriate diagnosis and medical treatment with full disclosure of the consequences of refusing or accepting such services

- providing adequate funding in project baselines to implement the CBDPP when work will be conducted in beryllium-controlled areas

- assessing the performance of work activities that involve exposure to beryllium.

4.0 DEFINITIONS

- *action level*: The level of exposure (0.2 ug/m^3 as an 8-hour time-weighted average or 1.0 ug/m^3 as a 30-minute excursion) above which protective measures such as engineering controls and personal protective equipment should be used. This level is considerably below the current OSHA beryllium exposure standard and is intended to minimize the incidence of both beryllium sensitivity and chronic beryllium disease.

- *controlled area*: An area in which the level of surface contamination exceeds the release level, or in which beryllium is stored, used, or has the potential for airborne release above the action level. Controlled areas are not required for properly labeled items or containers that do not have the potential for airborne release.

- *qualified industrial hygienist*: An individual who has formal training in industrial hygiene and who is familiar with the technical aspects of recognition, evaluation, and control of beryllium in the workplace.

- *release level*: The level of removable surface contamination [0.01 ug/cm^2 (9.3 ug/ft^2)] that is considered to be clean and can be released. This level is thought to be sufficient to prevent airborne exposure to beryllium and was developed by Lawrence Livermore National Laboratory.

- *risk evaluation level*: These levels, which are identified below, assume that the use of personal protective equipment will not be considered in determining beryllium airborne exposure levels.

    1. ***HIGH*** *risk exposure level*: Airborne exposure to beryllium above 2 ug/m^3, as an 8-hour time-weighted average. This is the present OSHA PEL.

    2. ***SIGNIFICANT*** *risk exposure level*: Airborne exposure to beryllium below 2 ug/m^3 but above 0.2 ug/m^3, as an 8-hour time-weighted average. The lower level is based upon 10% of the present OSHA PEL and is the action level identified for the CBDPP.

    3. ***LOW*** *risk exposure level*: Airborne exposure to beryllium below 0.2 ug/m^3 but above 0.01 ug/m^3, as an 8-hour time-weighted average. This level is based upon research conducted by Yoshida et al. (1997) and a summary presentation by Foster (1997).

4. ***NONE** (negligible risk)*: Airborne exposure to beryllium below 0.01 ug/m^3.

5.0 ELEMENTS OF THE CBDPP

5.1 Baseline Inventory

Hanford Site Contractors must evaluate each building or facility where past beryllium operations are known or suspected to have been conducted to determine the presence of beryllium contamination. The presence or absence of beryllium will be determined by applying historical process knowledge and/or by collecting surface smear samples. This information will then be the reference for establishing the Hanford Site Beryllium Baseline Inventory. This baseline inventory will be maintained by the Project Hanford Management Contractor (PHMC) and will continue to grow as more information is gathered as a result of building walk-downs, detailed area evaluations, and facility decontamination and demolition. Such information will be submitted quarterly by the Hanford Site Contractors to the PHMC.

Any Hanford Site Contractor who is responsible for current operations that involve the use, storage, or handling of beryllium must submit the following information quarterly to the PHMC:

- quantity and physical properties of the material
- description of the operation
- location where the material is stored and used
- engineering controls that are used
- type of monitoring that is conducted and the location of monitoring data.

5.2 Hazard Assessment

All Hanford Site Contractors must develop a risk-based method for assessing the beryllium exposure hazards associated with past, current, and future operations for which they are responsible. To prevent inconsistencies in the evaluation of employees and medical monitoring, the following classifications of employee risk exposure levels (as defined in Section 4.0) will be followed:

1. **HIGH**
2. **SIGNIFICANT**
3. **LOW**
4. **NONE**.

Employees who are determined to have current or future beryllium exposure resulting in **SIGNIFICANT** or **HIGH** risk will be required to participate in a medical surveillance program in accordance with Section 5.5 of this plan. Because of the uncertainty of estimating past exposures, employees whose past exposures resulted in **LOW**, as well as **SIGNIFICANT**, or **HIGH** risk will be offered participation in a medical surveillance program.

5.2.1 Past Operations

The Hanford Site Contractors must conduct a risked-based hazard assessment to identify potential

exposures to beryllium from past operations for which they were responsible. Such assessments are based upon exposure records or historical process knowledge. These assessments will be conducted and reviewed by a qualified industrial hygienist, who will determine the reliability and level of representation of exposure records and estimate the level of exposure from process information.

Exposure Records

The Hanford Site Contractors must evaluate available beryllium exposure records for which they are responsible. If adequate records are available to characterize the past exposure of employees to beryllium, then a risk exposure level will be assigned.

Historical Process Knowledge

Historical process knowledge can also be used in assigning risk exposure levels. Beryllium fact sheets, which will be prepared by the Hanford Site Contractor responsible for each facility where beryllium was known or suspected to be used, will contain information related to beryllium exposure levels. Based on the fact sheet information, an initial exposure estimate can be made as to the potential exposure.

- If an employee did not work in any of the facilities listed on the fact sheet, then the initial risk exposure level is **NONE**.

- If an employee worked in one or more of the facilities listed on the fact sheet, then the initial risk exposure level would be the same as that assigned to the facility on the fact sheet.

The initial assessment would then be modified based on existing data related to control measures, location and nature of the operation, and route of exposure. If one or more mitigating factors can be verified, then the final risk exposure level assigned to the employee would be reduced.

5.2.2 Current Operations

All Hanford Site Contractors must assess the risk of employee exposure to beryllium in current operations for which they are responsible. Classifications of employee risk will be based upon representative monitoring consistent with that provided in Section 5.3. Hanford Site Contractors must also comply with all applicable State, Federal, and U.S. Department of Energy (DOE) occupational safety and health regulations with respect to beryllium, including requirements for engineering controls and personal protective equipment.

Employee exposure will be limited to the action level provided in this plan. Beryllium-controlled areas will be established where airborne levels exceed the action level or surface contamination exceeds the release limit established in this plan.

5.2.3 Work Planning

In concert with the DOE Richland Operations Office, the Hanford Site Contractors have developed or are in the process of developing plans for an Integrated Safety Management System (ISMS). The primary objective of an ISMS is to systematically integrate environment, safety, and health into

work management and practices at all levels of work planning and execution.

Essential to integration of environment, safety, and health into work planning is the implementation of an effective hazard analysis process. Therefore, a cornerstone of the ISMS is the implementation of an optimized job hazard analysis process supported by an automated job hazard analysis tool. Other Hanford Site Contractors may use variations of job hazard analysis, such as activity hazard analysis or job safety analysis processes.

The appropriate hazard analysis process is to be implemented by the Hanford Site Contractors and their major subcontractors through the ISMS initiatives. Through these processes, hazard identification, analysis, and control is to be integrated with the work control process that will simultaneously be refined to incorporate ISMS principles.

Beryllium identification, evaluation, and control will be incorporated as one hazard to be specifically addressed through these ISMS hazard analysis processes. As an example, the automated job hazard analysis tool incorporates a hazard analysis process for beryllium and guides the evaluator through controls and actions that are required to ensure that any beryllium hazards are identified and mitigated for work activities.

5.3 Employee Exposure Assessment

Exposure monitoring for employees who are engaged in beryllium operations will be conducted to collect exposure data that is representative of employee exposure. The exposure monitoring data will support the estimates of the magnitude, frequency, and duration of potential beryllium exposure to employees who perform a variety of work activities. Exposure monitoring will be documented as part of the Beryllium Exposure Assessment Plan.

The Beryllium Exposure Assessment Plan will be developed for all projects where beryllium exposure is identified as a potential risk to employees. The plan will include

- an assessment of the beryllium exposure hazard
- adequate data to establish a baseline characterization and inventory for the affected work areas
- names of employees or job classifications potentially exposed to beryllium during work activities
- documentation and record keeping requirements
- communications of exposure monitoring results to workers and management
- medical monitoring requirements.

Beryllium exposure monitoring will be conducted by or under the supervision of a qualified industrial hygienist.

5.4 Exposure Reduction and Minimization

One goal of the Hanford Site is to minimize the number of employees who may be exposed to beryllium. The number of employees who are potentially exposed to beryllium is a fundamental part of the hazard assessment process.

The Hanford Site Contractors must develop an approach to conducting work in areas that contain

beryllium. The approach to reducing risk will be documented in the Beryllium Exposure Assessment Plan. Risk reduction can be accomplished numerous ways and must be evaluated by project. Methods that may be employed for exposure and risk reduction include

- evaluating the contamination control options to maintain exposures to as low as practicable. Methods include engineering controls (e.g., ventilation), administrative controls (e.g., restricted access areas, scheduling activities on off-shifts), and personal protective equipment (e.g., clothing, respirators). Engineering controls must always be considered as the primary control option, followed by administrative controls; personal protective equipment is considered the last option.

- limiting the number of employees who have access to areas that contain beryllium to only essential workers and support personnel

- establishing restricted areas that have controlled access, including posting the appropriate warning signs and requiring signature on access control logs

- evaluating decontamination facilities, change rooms, and shower facilities for each project in an effort to minimize cross-contamination or the spread of contamination. This action also limits potential exposures to the employee from personal hygiene issues and prevents spread of contamination to private residences.

- posting warning signs and labels for all restricted access areas, waste containers, equipment, and other items that have the potential for containing or are contaminated with beryllium

- designing work practices to minimize the potential for airborne releases of beryllium particulate. Dry sweeping or cleaning of beryllium-contaminated areas are prohibited. Acceptable methods for cleaning are high-efficiency particulate air vacuums or wet methods.

- designing an effective waste management program to limit exposure to beryllium wastes.

Risk-reduction approaches used must be documented and completed for each project and/or work activity.

5.5 Medical Surveillance

Hanford Site Contractors must provide medical surveillance to their employees who have been identified as having **HIGH**, **SIGNIFICANT**, or **LOW** risk of beryllium exposure or who, in the opinion of the examining physician, have exhibited a combination of symptoms consistent with the presence of chronic beryllium disease.

The Hanford Site Medical Contractor will conduct the Hanford Site Beryllium Medical Surveillance Program. Employees who are currently exposed to beryllium will be placed in the Current Beryllium Worker Medical Surveillance Program via the Employee Job Task Analysis system. Employees who were exposed in the past and were identified as a **HIGH**, **SIGNIFICANT**, or **LOW** risk or who terminated work with beryllium will be placed in a Previous Beryllium Worker Medical Surveillance Program.

All employees who are presently working on the Hanford Site will be given an opportunity to complete a questionnaire for the purpose of self-identifying possible exposure and symptoms that may be consistent with chronic beryllium disease. Through this method, employees will be identified who may have been exposed to beryllium in the past but for whom no current record exists. Because the questionnaire may contain medical data, all completed questionnaires will first be forwarded to the Hanford Site Medical Contractor. The portion of the questionnaire related to potential exposure will then be forwarded to the applicable contractor's Safety and Health staff for evaluation of risk of exposure.

As part of the Hanford Site Beryllium Medical Surveillance Program, employees will be provided a Beryllium Lymphocyte Proliferation Test. A consent form must be completed and returned before this test is performed. For employees who have been exposed to beryllium in the past, all parts of the beryllium medical surveillance evaluation are voluntary. For employees who are currently exposed to beryllium, the test is voluntary but participation in the beryllium medical surveillance evaluation will be required.

5.6 Training

Hanford Site Contractors must provide annual training on items such as beryllium hazards, control measures, and appropriate personal protective equipment to their employees who may be exposed to the action level provided in this plan. Hanford Site Contractors also must inform their employees of developments in the diagnosis of chronic beryllium disease and locations where past beryllium operations have occurred.

5.7 Record Keeping

Records that are associated with the facility baseline will be maintained by the PHMC and will be available to the Hanford Site Contractors and DOE. Each Hanford Site Contractor will retain their own beryllium exposure monitoring records in accordance with OSHA standards and applicable DOE Orders and will provide copies of exposure monitoring records to the PHMC for inclusion in the Hanford Site Industrial Hygiene Database. Each Hanford Site Contractor will also maintain their own records related to assessment of employee exposure risk, employee interviews, and other relevant information. Medical records will be retained by the Hanford Site Medical Contractor, and data obtained from the Hanford Site Beryllium Medical Surveillance Program will be periodically reviewed.

Records must be easily retrievable and maintained in electronic format.

5.8 Performance Feedback

Performance measurement will be an essential element of all work activities that involve the potential for exposure to beryllium. Performance metrics will be used to track the effectiveness of the exposure monitoring plans and exposure reduction and minimization goals. These measurement systems will be project- or activity-specific and will be included in appropriate plans, procedures, and/or work packages.

6.0 REFERENCES

29 CFR 1910.1450. 1997. Occupational Safety and Health Administration. "Occupational Exposure to Hazardous Chemicals in Laboratories." U.S. Code of Federal Regulations.

Foster, G. 1997. "Studies and Case Reports of Low Exposures." Presented at the DOE Occupational Exposure and CBD Prevention Workshop, September 16-18, 1997.

Yoshida, T, et.al. 1997. "A Study on the Beryllium Lymphocyte Transformation Test and the Beryllium Levels in Working Environment." *Industrial Health* 35:374-79.

University of Washington. 1997. *Needs Assessment for Medical Surveillance of Former Hanford Workers, Phase I – October 1, 1997*. Report Version 1.1, October 1, 1997.